

sinuate; antennæ ochraceous, the apical joint infusate, first joint not reaching apex of head, second and third subequal in length, each a little shorter than fourth or fifth; pronotum nearly twice as broad between humeral angles as median length, posterior half black, thickly punctate, anterior half testaceous, less thickly punctate, with two large black spots near each anterior angle, behind these are two central levigate pale ochraceous spots only separated by a series of dark punctures, the anterior lateral margins also pale ochraceous, posterior angles obtusely prominent; scutellum black or dark castaneous, thickly coarsely punctate, with a large oblique levigate pale ochraceous spot near each basal angle; corium coarsely punctate, the basal area dull ochraceous, darkly punctate, the apical area blackish; head beneath black, its basal margin ochraceous; sternum dull ochraceous, thickly darkly punctate, its lateral margins paler and impunctate, posterior angles of prosternum and sublateral margins of meso- and metasterna black or blackish; abdomen beneath shining black, the lateral margins ochraceous, somewhat thickly punctate, extreme lateral margin with small black spot at the segmental incisures; leg ochraceous spotted with black.

Long 5 to  $5\frac{1}{2}$  mm.

*Hab.* Queensland; Mackay (*R. E. Turner*, Brit. Mus.).

Allied to *N. formosa*, Dist., but with the basal angular levigate spots to scutellum much smaller and much wider apart, the levigate discal space on pronotum divided by punctures, &c., this last character also separating it from *N. fasciolata*, Stål, which is thus described: "marginibus lateralibus anticis, fasciolaque discoidali lævigatus thoracis."

#### *Neostollia formosa.*

*Sepontia formosa*, Dist. Ann. & Mag. Nat. Hist. (7) xii, p. 474 (1903).

Malayan Archipelago; Tomia.

[To be continued.]

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### LIII.—*The Anatomy and Classification of the Teleostean Fishes of the Order Zeomorphi.* By C. TATE REGAN, M.A.

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THE fishes of the order Zeomorphi are acanthopterous physoclists with thoracic pelvic fins and the pelvic bones directly attached to the cleithra. They are peculiar in that the

spines which precede the anal form a separate fin, this spinous anal, however, being much shorter than the spinous dorsal and formed of only one to four spines; the caudal has 12 or 13 principal rays, of which 10 to 12 are branched; in addition there are 1 to 3 small simple rays above and below. Each pelvic fin is formed of a spine and of from 5 to 9 branched rays; this suggests relationship to the Berycoids, and indeed the Zeomorphi appear to differ from the Berycomorphi only in certain features of specialization, such as the reduction in number of the caudal rays and the absence of an orbitosphenoid. The simple post-temporal, which bridges the posterior temporal fossa and is rigidly united to the epiotic or parietal above and to the opisthotic or pterotic below, has a 'temporal' plate firmly attached along its anterior edge; the cleithrum runs upwards internal to the supra-cleithrum and ends in a pointed projection just behind the post-temporal, and there is a single post-cleithrum on each side. The first vertebra is very firmly attached to the cranium, the centrum to the basioccipital, and the neural arch, which is open above, to the exoccipitals; in the præcaudal region the anterior neural spines are directed backwards, but the posterior ones are erect or even point forwards; the anterior præcaudal vertebræ have no parapophyses and the ribs are sessile, but the posterior ones are furnished with downwardly directed parapophyses to which the ribs are attached.

The fishes which have the above features in common may be thus arranged:—

#### Family 1. Zeidæ.

Mouth very protractile; no supramaxillary; no subocular shelf. Anterior trunk-muscles not or only just reaching the posterior ends of the frontals, which are formed of ridged, tuberculated, or pitted lateral portions bordering a median depression for the reception of the long posterior processes of the præmaxillaries; occipital crest thin; suspensorium inclined obliquely forwards and metapterygoid reduced; 7 or 8 branchiostegals;  $3\frac{1}{2}$  gills, no slit behind the last; pseudo-branchiæ present. 31 to 46 vertebræ. Caudal with 13 principal rays, of which 11 are branched; 1 to 4 anal spines; each pelvic fin of a spine and 5 to 9 branched rays.

Recent genera are *Zeus*, Linn., *Zenopsis*, Gill, *Cyttus*, Günth., *Cyttopsis*, Gill, *Cyttosoma*, Gilchr., *Neocyttus*, Gilchr., *Pseudocyttus*, Gilchr., *Oreosoma*, Cuv. & Val., *Zenion*, Jord. & Everm., *Capromimus*, Gill, and *Grammicolepis*, Poey.

*Zeus* appears to date from the Oligocene, and the name *Cyttoides* has been given to an Oligocene fish of this family.

Starks has given a good account of the osteology of *Zeus* (Proc. U.S. Nat. Mus. xxi. 1898) and Shufeldt has described the skeleton of the unique specimen of *Grammicolepis* (Journ. Morph. ii. 1889). I have examined skeletons of *Zeus*, *Cyttus*, and *Neocyttus*; the last two differ from *Zeus* and resemble *Grammicolepis* in the presence of a basisphenoid, and in the greater prominence of the supraoccipital, which separates the parietals. In *Zeus* and *Cyttus* there are 31 or 32 vertebræ and the downwardly directed parapophyses of the posterior præcaudals unite to form closed hæmal arches; in *Neocyttus*, which has 40 vertebræ, the parapophyses are somewhat divergent and only the last three pairs are bridged across, whilst *Grammicolepis*, with 46 vertebræ, seems to have a like structure.

*Neocyttus* is very similar to *Grammicolepis* in cranial osteology, and comparison of the skeleton of the former with Shufeldt's figures of the latter shows that the main difference is that in *Neocyttus* the supraoccipital and parietals are smaller and the frontals larger, with their rugose portions expanded behind and nearly meeting in front of the supraoccipital. Rather large rugose nasal bones are firmly attached on each side to the anterior ends of the frontals and project inwards above the præmaxillary processes; it is evident that Shufeldt has mistaken these for part of the frontals.

## Family 2. Caproidæ.

Anterior trunk-muscles not reaching the frontals, which are rugose; occipital crest with the upper edge thickened and rugose. 6 branchiostegals; 4 gills, a slit behind the fourth; pseudobranchiæ present. 22 vertebræ. Caudal fin with 12 principal rays, all or 10 of which are branched; 3 anal spines; each pelvic fin of a spine and 5 branched rays.

### Subfamily 1. *ANTIGONINÆ*.

Mouth moderately protractile; præmaxillary processes only just reaching the frontals; maxillary broad, bearing a large supramaxillary; no subocular shelf. Spinous dorsal shorter than the soft-rayed fin.

The skeleton of the single genus *Antigonia*, Lowe, has been well described by Starks (Proc. U.S. Nat. Mus. xxv. 1902), who has, however, overlooked one feature of importance, viz., the firm attachment of the first vertebra to

the skull. As he gives the number of vertebræ as 21 it seems probable that in the preparation of the skeleton the first vertebra adhered to the cranium, and was then removed separately and perhaps lost.

### Subfamily 2. *CAPROINÆ*.

Mouth extremely protractile; præmaxillary processes very long, separating the frontals and extending back beneath the supraoccipital; maxillary narrow, without supramaxillary; a broad subocular shelf. Spinous dorsal not shorter than the soft-rayed fin.

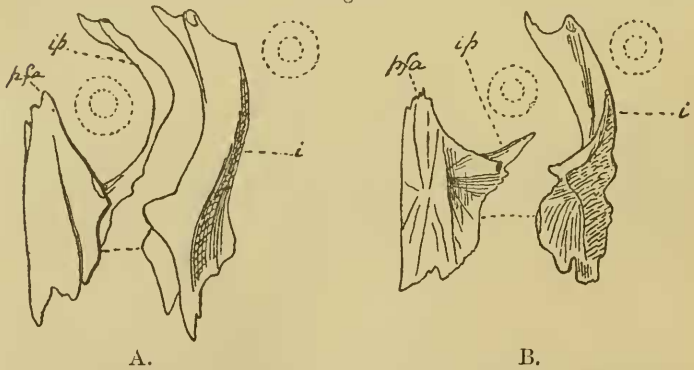
The Miocene *Proantigonia*, Kramberger, is closely allied to the recent *Capros*, Lacep.

## LIV.—*The Origin and Evolution of the Teleostean Fishes of the Order Heterosomata.* By C. TATE REGAN, M.A.

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THE Heterosomata, or Flat-fishes, differ from all other fishes in their asymmetry; both eyes are on one side, which is coloured, whilst the eyeless side is usually white.

Fig. 1.



Disarticulated frontal bones of (A) Halibut (*Hippoglossus hippoglossus*) and (B) Plaice (*Pleuronectes platessa*). (After Traquair.)

*pfa*, præfrontal articulation; *ip*, interorbital process; *i*, interorbital bar.

In the skull of all flat-fishes there is a bony interorbital bar mainly formed by the interorbital portion of the frontal bone